Foundations of Mathematics and Pre-Calculus 10

Name: KEY **Block:** ________ **Date:** ________ **ID: A**

Chapter 1 - Radicals. NON-CALCULATOR SECTION - PRACTICE TEST

Multiple Choice

Identify the choice that best completes the statement or answers the question.

C 1. To which set of numbers does $10.\overline{56}$ ← repeating decimal ∴ rational

a. whole b. integer c. rational d. irrational

C 2. Determine the greatest common factor of 24 and 40

a. 2^2 b. $2^3 \times 7 \times 11$ c. 2^3 d. 2×7

$24 = \boxed{2^3} \times 3$

$40 = \boxed{2^3} \times 5$

The common factor is 2^3

C 3. What is the least common multiple of 54 and 72.

a. 2×3 b. $2^2 \times 3^2$ c. $2^3 \times 3^3$ d. $2^4 \times 3^2$

$54 = 2 \times \boxed{3^3}$

$72 = \boxed{2^3} \times 3^2$

The L.C.M. must contain the highest power of each factor

∴ L.C.M. $= 2^3 \times 3^3$

b 4. Determine the sqaure root of 160 000

a. 4 b. 400 c. 40 000 d. 4000

$\sqrt{160000} = \sqrt{16} \times \sqrt{10000} = 4 \times 100 = 400$

or $= \sqrt{4^2} \times \sqrt{10^4} = 4 \times \sqrt{(10^2)^2} = 4 \times 100 = 400$

a 5. Which power with a negative exponent is equivalent to $\frac{1}{25}$?

a. 5^{-2} b. -5^{-2} c. 2^{-5} d. $(-5)^2$

$\frac{1}{25} = \frac{1}{5^2} = 5^{-2}$ because $x^{-n} = \frac{1}{x^n}$

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b 6. Write $43^{\frac{5}{6}}$ as a radical. $= \left(43^{\frac{1}{6}}\right)^5 = \left(\sqrt[6]{43}\right)^5$

a. $\sqrt[5]{43^6}$ b. $\left(\sqrt[6]{43}\right)^5$ c. $\sqrt[0.83]{43}$ d. $\left(\sqrt[5]{43}\right)^6$

$\boxed{\text{RULE: } x^{m/n} = \sqrt[n]{x^m} = \left(\sqrt[n]{x}\right)^m}$

b 7. Write $\sqrt{200}$ in simplest form.

a. $2\sqrt{50}$ b. $10\sqrt{2}$ c. $100\sqrt{2}$ d. $2\sqrt{10}$

$\sqrt{200} = \sqrt{100 \times 2} = \sqrt{100} \times \sqrt{2} = 10\sqrt{2}$

$\boxed{\text{RULE: } \sqrt{ab} = \sqrt{a} \cdot \sqrt{b}}$

C 8. Write $9\sqrt{2}$ as an entire radical.

a. $\sqrt{18}$ b. $\sqrt{36}$ c. $\sqrt{162}$ d. $\sqrt{324}$

$9\sqrt{2} = \sqrt{9^2 \times 2} = \sqrt{81 \times 2} = \sqrt{162}$

$\boxed{\text{RULE: } a\sqrt[n]{b} = \sqrt[n]{a^n b}}$

b 9. Evaluate $216^{\frac{1}{3}}$ without using a calculator.

a. 14.7 b. 6 c. –6 d. 72

$= \sqrt[3]{216} = 6$ or

$$\begin{array}{r|l} 2 & 216 \\ 2 & 108 \\ 2 & 54 \\ 3 & 27 \\ 3 & 9 \\ & 3 \end{array}$$

$\sqrt[3]{216} = \sqrt[3]{2^3 \times 3^3} = \sqrt[3]{2^3} \times \sqrt[3]{3^3} = 2 \times 3 = 6$

C 10. Evaluate $\left(\frac{16}{81}\right)^{\frac{1}{4}}$ without using a calculator.

a. $\frac{4}{81}$ b. $\frac{2}{9}$ c. $\frac{2}{3}$ d. $\frac{4}{9}$

$\left(\frac{16}{81}\right)^{1/4} = \frac{16^{1/4}}{81^{1/4}} = \frac{\sqrt[4]{16}}{\sqrt[4]{81}} = \frac{\sqrt[4]{2^4}}{\sqrt[4]{3^4}} = \frac{2}{3}$

$\boxed{\text{RULE: } \left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}}$

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Chapter 1 Test: Radicals (CALCULATOR section) PRACTICE TEST

Multiple Choice

Identify the choice that best completes the statement or answers the question.

a 1. To which set(s) of numbers does $-\sqrt{49}$ belong?

I	Natural
II	Integer
III	Rational
IV	Irrational

$-\sqrt{49} = {}^-7$ not NATURAL not IRRATIONAL

(a.) II and III only b. III only c. I, II and III only d. IV only

b 2. Which of these numbers is an integer, but not a whole number?

$-8, 0, 5, \sqrt{7}$

WHOLE #'s ARE 0, 1, 2, 3, ...

a. 0 (b.) -8 c. $\sqrt{7}$ d. 5

d 3. Which of these numbers is rational?

$\sqrt{\frac{4}{25}}, \sqrt{24}, \sqrt[3]{25}, \sqrt{2.5}$

R I I I

$\sqrt{\frac{4}{25}} = \frac{\sqrt{4}}{\sqrt{25}} = \frac{2}{5}$

a. $\sqrt{24}$ b. $\sqrt{2.5}$ c. $\sqrt[3]{25}$ (d.) $\sqrt{\frac{4}{25}}$

d 4. Write an equivalent form of $\frac{4}{5}$ as a square root.

$\sqrt{\frac{4^2}{5^2}} = \sqrt{\frac{16}{25}}$

a. $\sqrt{\frac{16}{10}}$ b. $\sqrt[3]{\frac{64}{125}}$ c. $\sqrt{\frac{8}{25}}$ (d.) $\sqrt{\frac{16}{25}}$

b 5. A cube has a volume of 2048 cm^3. Determine the edge length of the cube as a radical in simplest form.

a. $8\sqrt[3]{32}$ cm (b.) $8\sqrt[3]{4}$ cm c. $64\sqrt[3]{4}$ cm d. $4\sqrt[3]{8}$ cm

$\sqrt[3]{2048} = \sqrt[3]{2^{11}} = \sqrt[3]{2^3 \cdot 2^3 \cdot 2^3 \cdot 2^2} = 2 \cdot 2 \cdot 2 \sqrt[3]{2^2}$
$= 8\sqrt[3]{4}$

2 | 2048 = 2^{11}
2 | 1024
2 | 512
2 | 256
2 | 128
2 | 64
2 | 32
2 | 16
2 | 8
2 | 4
2

c 6. Evaluate $\sqrt{0.0196}$.

a. 0.0098 b. 0.0049 (c.) 0.14 d. 0.014

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b 7. Determine which of these numbers is the least.

$\sqrt{14}$, $\sqrt[3]{30}$, $\sqrt[3]{100}$, $\sqrt[3]{75}$, $\sqrt{17}$

a. $\sqrt[3]{100}$ b. $\sqrt[3]{30}$ c. $\sqrt{14}$ d. $\sqrt[3]{75}$

compare $\sqrt[3]{30}$, $\sqrt[3]{100}$, $\sqrt[3]{75}$ $\longrightarrow$ $\sqrt[3]{30}$ is the least of these three

$\sqrt{14}$ is less than $\sqrt{17}$ use your calculator... $\sqrt{14} = 3.74$

$\sqrt[3]{30} = 3.10$

C 8. Evaluate $\left(\dfrac{27}{216}\right)^{\frac{5}{3}}$.

a. $\dfrac{243}{36}$ b. 0.287 174... c. $\dfrac{243}{7776}$ d. $\dfrac{243}{216}$

$= \dfrac{27^{5/3}}{216^{5/3}} = \dfrac{(\sqrt[3]{27})^5}{(\sqrt[3]{216})^5} = \dfrac{3^5}{6^5} = \dfrac{243}{7776}$

C 9. Evaluate $\left(\dfrac{11}{5}\right)^{-3}$.

$\boxed{\text{RULE: } \left(\frac{a}{b}\right)^{-x} = \left(\frac{b}{a}\right)^{x}}$

a. $-\dfrac{125}{1331}$ b. $-\dfrac{1331}{125}$ c. $\dfrac{125}{1331}$ d. $-\dfrac{1}{33}$

$= \left(\left(\dfrac{11}{5}\right)^{-1}\right)^3 = \left(\dfrac{5}{11}\right)^3 = \dfrac{5^3}{11^3} = \dfrac{125}{1331}$

a 10. Evaluate $125^{-\frac{4}{3}}$

a. $\dfrac{1}{625}$ b. $\dfrac{3}{500}$ c. $-\dfrac{1}{625}$ d. -625

$= \left((125)^{4/3}\right)^{-1} = \left((\sqrt[3]{125})^4\right)^{-1} = (5^4)^{-1} = (625)^{-1} = \dfrac{1}{625}$

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b 11. Simplify $m^{-4}n^{6} \cdot m^{5}n^{-9}$. Write using powers with positive exponents.

a. mn^{3} b. $\dfrac{m}{n^{3}}$ c. $\dfrac{n^{15}}{m^{9}}$ d. $\dfrac{n^{3}}{m}$

$$= \frac{n^6 \; m^5}{m^4 \; n^9} = \frac{\cancel{n}\cdot\cancel{n}\cdot\cancel{n}\cdot\cancel{n}\cdot\cancel{n}\cdot\cancel{n}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{m}\cdot m}{\cancel{m}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{n}\cdot\cancel{n}\cdot\cancel{n}\cdot\cancel{n}\cdot\cancel{n}\cdot\cancel{n}\cdot n\cdot n\cdot n} = \frac{m}{n\cdot n\cdot n}$$

d 12. Simplify $\dfrac{12p^{4}q^{-5}}{28pq^{4}}$. Write using powers with positive exponents.

a. $\dfrac{3p^{4}}{7q^{9}}$ b. $\dfrac{p^{3}}{16q^{9}}$ c. $\dfrac{3p^{3}}{7q}$ d. $\dfrac{3p^{3}}{7q^{9}}$

$$\frac{3\,\cancel{12}\;p^{\cancel{4}\,3}}{7\,\cancel{28}\;\cancel{p}\;q^4\;q^5} = \frac{3\,p^3}{7\,q^9}$$

b 13. Evaluate $\left(-\frac{2}{5}\right)^{\frac{3}{4}} \cdot \left(-\frac{2}{5}\right)^{\frac{5}{4}}$. $= \left(\frac{-2}{5}\right)^{3/4+5/4} = \left(\frac{-2}{5}\right)^{8/4} = \left(\frac{-2}{5}\right)^{2} = \frac{(-2)^2}{5^2} = \frac{4}{25}$

a. $\dfrac{2}{5}$ b. $\dfrac{4}{25}$ c. $\dfrac{25}{4}$ d. $-\dfrac{4}{25}$

a 14. Simplify $\dfrac{\left(3.5^{-5}\right)\left(3.5^{8}\right)}{3.5^{-4}}$ by writing as a single power.

a. 3.5^{7} b. 3.5^{-36} c. 3.5^{-11} d. 3.5^{-1}

$$= \frac{3.5^4 \cdot 3.5^8}{3.5^5} = \frac{3.5^{4+8}}{3.5^5} = \frac{3.5^{12}}{3.5^5} = 3.5^{12-5} = 3.5^7$$

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b 15. Simplify $\frac{\left(m^{5}n^{-3}\right)^{-1}}{\left(m^{-4}n\right)^{4}}$. $= \frac{m^{-5}n^{3}}{m^{-16}n^{4}} = \frac{m^{16}n^{3}}{m^{5}n^{4}} = \frac{m^{11}}{n}$

a. $\frac{m^{11}}{n^{7}}$ b. $\frac{m^{11}}{n}$ c. $\frac{m^{21}}{n}$ d. $\frac{m^{21}}{n^{7}}$

b 16. Simplify: $\frac{(2a^{2}b)^{5}}{(4a^{2}b^{3})^{2}} = \frac{2^{5}a^{10}b^{5}}{4^{2}a^{4}b^{6}} = \frac{32a^{6}}{16b} = \frac{2a^{6}}{b}$

a. $\frac{5a^{6}}{4b}$ b. $\frac{2a^{6}}{b}$ c. $\frac{2a^{3}}{b}$ d. $\frac{1}{2b}$

d 17. Simplify: $\left(\sqrt[4]{x^{3}}\right)\left(\sqrt[8]{x^{12}}\right) = x^{3/4} \cdot x^{12/8} = x^{3/4} \cdot x^{6/4} = x^{3/4 + 6/4} = x^{9/4}$

a. $x^{\frac{9}{8}}$ b. $x^{\frac{5}{4}}$ c. x^{2} d. $x^{\frac{9}{4}}$

b 18. Which of the following expressions is equivalent to $\frac{1}{\sqrt[5]{x^{4}}}$ $= \frac{1}{x^{4/5}} = x^{-4/5}$

a. $x^{-\frac{5}{4}}$ b. $x^{-\frac{4}{5}}$ c. $-x^{\frac{4}{5}}$ d. $x^{\frac{4}{5}}$

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$\underline{a}$ 19. Order these numbers from greatest to least: $2\sqrt{5}$, $\sqrt[3]{68}$, $\sqrt[3]{6}$

a. $2\sqrt{5}, \sqrt[3]{68}, \sqrt[3]{6}$ c. $2\sqrt{5}, \sqrt[3]{6}, \sqrt[3]{68}$

b. $\sqrt[3]{6}, \sqrt[3]{68}, 2\sqrt{5}$ d. $\sqrt[3]{68}, 2\sqrt{5}, \sqrt[3]{6}$

$\sqrt{16} \xleftrightarrow{9} \sqrt{25}$

$4 \quad 5$

$\sqrt[3]{64} \longleftrightarrow \sqrt[3]{125}$

$2\sqrt{5} = \sqrt{4\times5} = \sqrt{20}$

$\sqrt[3]{68} > 4$

$\sqrt{20} \doteq 4\frac{4}{9}$

$\sqrt[3]{68} \doteq 4\frac{4}{61}$

smallest $\rightarrow \sqrt[3]{6} < 2$ because $2^3 = 8$ $\therefore$ answer is a ~~or~~ d

YOU CAN ALSO USE YOUR CALCULATORS!

$2\sqrt{5} = 4.47$

$\sqrt[3]{68} = 4.08$

$\sqrt[3]{6} = 1.82$

$\underline{a}$ 20. Simplify $\left(64a^6b^{15}\right)^{\frac{2}{3}}$.

a. $16a^4b^{10}$ b. $16a^9b^{10}$ c. $64a^4b^{10}$ d. $16a^4b^{25}$

$= 64^{2/3}\, a^{6(2/3)}\, b^{15(2/3)}$

$= (\sqrt[3]{64})^2\, a^{12/3}\, b^{30/3}$

$= (4)^2 a^4 b^{10}$

$= 16a^4b^{10}$